MM-6854 / MM-6864
GSM Dual-Band Data Modem

MM-6854

MM-6864

Application Notes

maxon®

WARNINGS

Internal components containing beryllium oxide are used in the equipment. Dust from this material is a health hazard if inhaled or allowed to come into contact with the skin. Great care must be taken when handling these components. They must not be broken or subjected to excessive heat.

Never operate the modem without the correct Maxon antenna, or a suitable artificial load, connected.

Never modify a modem, or accessory, except as instructed by Maxon in a formal communication as this may invalidate any warranty, guarantee or type approval.

Do not operate this equipment in environments containing explosive materials or vapour. This includes Petrol service stations.

This equipment should only be operated while stationary or with a hands-free accessory, provided that doing so does not interfere with driving safety.

This equipment should not be operated on an aircraft as it is forbidden by law. It should not be operated in the vicinity of medical equipment.

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1 INTRODUCTION

1.1 Overview

This document provides Application information for the MM-6854/64 GSM Dual-Band Data Modem and refers to software version 1.07 onwards.

This first section provides a brief overview of the products. Further sections go into more detail on the various functions that are available and how they can be applied.

1.2 How this document is organised

Section 1 – Brief overview of the modems.
Section 2 – Basic Specifications
Section 3 – Typical Applications
Section 4 – Operation
Section 5 – AT Commands
Section 6 – Debugging and Indicator Lights
Section 7 – Installation – Covers the main points of installation.
Section 8 – Appendices - Provides information on the configuration of PCs.
Section 9 – Glossary

1.3 What are the MM6854/64

The MM-6854/64 are GSM Dual-Band Data Modems, they differ by the following:

MM-6854   Boxed modem, featuring internal back-up battery, requiring only the connection of power and RS-232 serial data.

MM-6864   Basic PCB OEM GSM modem. For integration into a customer's equipment.

1.4 Recommended Procedures

1. Radio Link Protocol should be used.
2. Observe flow control.
3. Data is not acknowledged, therefore ensure that the application does this.

1.5 Contact Information

Should you have any queries regarding this manual, or the information within it, please contact:

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Internet: www.maxon.co.uk

1.6 Summary

This section has provided a basic introduction to the products.

2 SPECIFICATIONS

2.1 Basic Specifications

Performance Specifications	**91/263/EEC** **ETS 300 342-1** **ETSI GSM 0707/05 AT commands plus Extended** **SMS GSM rec. 7.05 including PDU mode** **GSM 04.21 transparent data** **GSM 04.22 non-transparent data**
Frequency Range	**890 to 960MHz** **1710 to 1880MHz**
RF Output Power	**Class 4 (2W) for 900MHz** **Class 2 (1W) for 1800MHz**
Receiver Sensitivity	**-102dBm at 900MHz, -100dBm at 1800MHz** **(<2% bit error rate)**
Modulation Type	**Modified GMSK**
Intermediate Frequency	**282MHz**
Transmit Attack Time	**<25mS**
RS-232 Interface	**V24 9 pin D-type** Baud rate 300 – 57600 baud, no autobauding. Set to 19200 as default. Parity: None, Space, Odd, Even or Mark Character Format: 7 or 8 Stop bits: 1 or 2 Level: To CCITT Recommendation V.28

Data Communication	**Transparent** Non-error corrected link according to GSM 04.21 User rates:

2400 bps	V.22 bis / V.26 ter / V.110
4800 bps	V.32 / V.110
9600 bps	V.32 / V.110
14400 bps	V.32 / V.110 GPRS1

Non-Transparent
Error connected link according to GSM 04.22 (V.42)
User rates:

9600 bps	V.32 / V.110
14400 bps	V.32 / V.110 GPRS1

Note: When using V.110, the correspondent has to be an ISDN adapter. Data compression according to V.42 bis.

Transparent Fax
Group 3, Class 1 support only.
User rates;
2400 bps
4800 bps
7200 bps
9600 bps

SMS
GSM rec. 7.05, including PDU mode

SIM card Interface	Small size SIM, 3 or 5V

General Specifications

Temperature Range **(Performance without degradation unless stated)**
Operating **-20 to +60°C**
Charging **0 to +40°C**

Power Consumption **Standby** **25mW**
Charging / On-air **4W max.**

Current Consumption **12V** **333mA – fit 800mA A/S fuse**
24V **166mA – fit 500mA A/S fuse**
Supply Voltage **+9V minimum to +28V DC maximum**

Dimensions **172mm long x 82mm wide x 30mm high**
Weigh **260 grams**

Note: Maxon Europe reserves the right to alter these specifications without prior notification as part of our continuous improvement policy.

2.2 Summary

This section has outlined the basic specifications of the MM6854/64.

3 SYSTEM APPLICATIONS

Fleet Management	Construction	Transportation
Anti-Theft	Utilities	Emergency Services
Refrigerated Trucks	Taxis	Delivery Vans
Courier Companies	Vending Machines	Surveillance

Figure 3-1 - Applications

3.1.1 GSM / GPS Application

One example of an application is sending data and GPS information via the GSM Network.
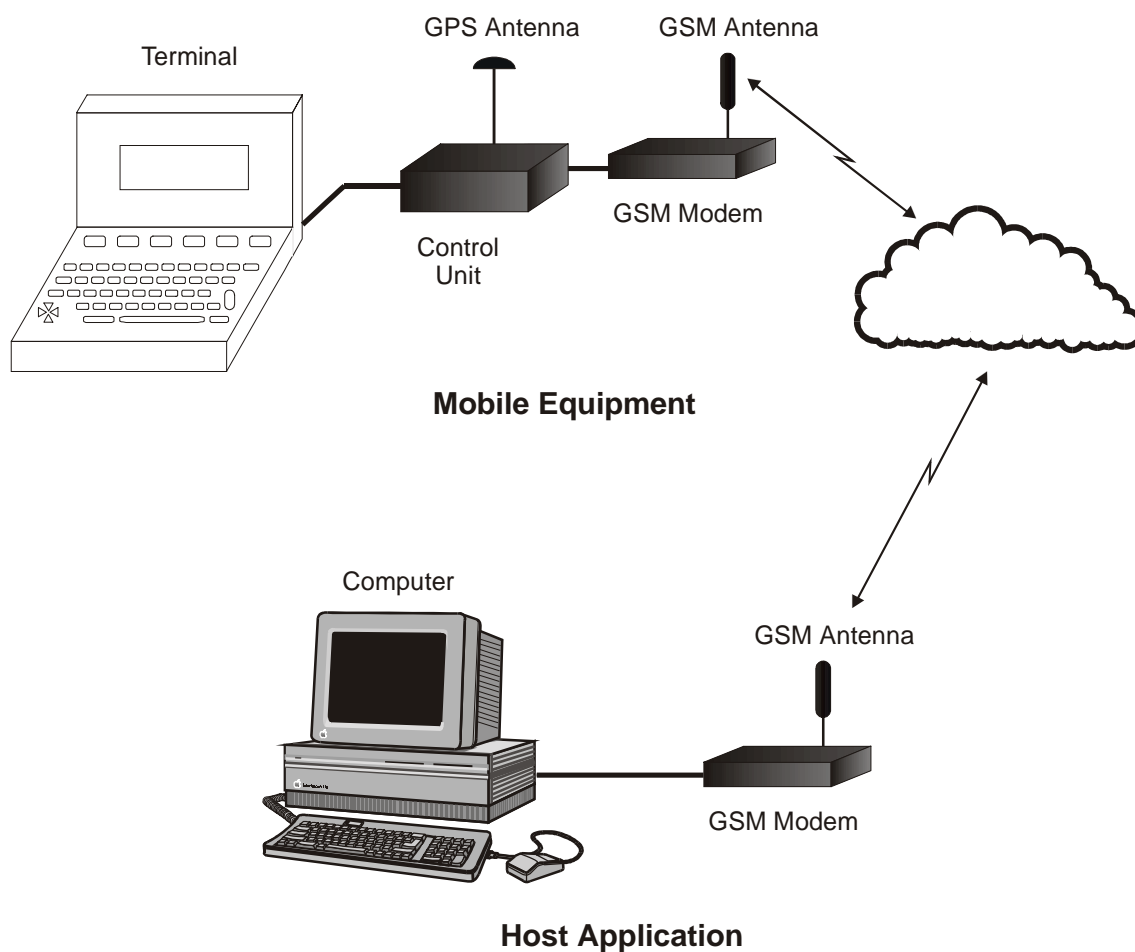
Figure 3-2 - GSM / GPS Application

4 OPERATION

4.1 Introduction

This section covers the simple operation of the modems. It provides the relevant information for the user to get the modem up and running.

A +9V to +28VDC power supply will be required, together with a Windows 95 PC, installed with Hyper Terminal, or similar package, a CA8360 power cable, a CA8401 antenna and a CA8361 PC serial cable.

4.2 Network Connection

It is necessary to obtain a SIM from your chosen Network Provider. <u>This SIM must be suitable for Data service.</u>

All information needed to connect you to the network and to initiate billing for your calls is stored in the gold-plated area of the SIM card, along with the names, numbers and messages you have entered into the phone book, or received.

To prevent either, the loss of information or corruption of information, avoid touching the gold area and do not place the SIM near electrical or magnetic fields.

A damaged SIM will not allow you to access the GSM network.

4.2.1 Inserting the SIM card

The SIM card will probably be supplied in a cardholder and will need to be carefully pressed free, before fitting.

The modem must not be powered. If the 25 way D-type connector is removed, this ensures that this is the case. The modem should be turned upside down and the two small countersunk screws removed to expose the SIM card area.
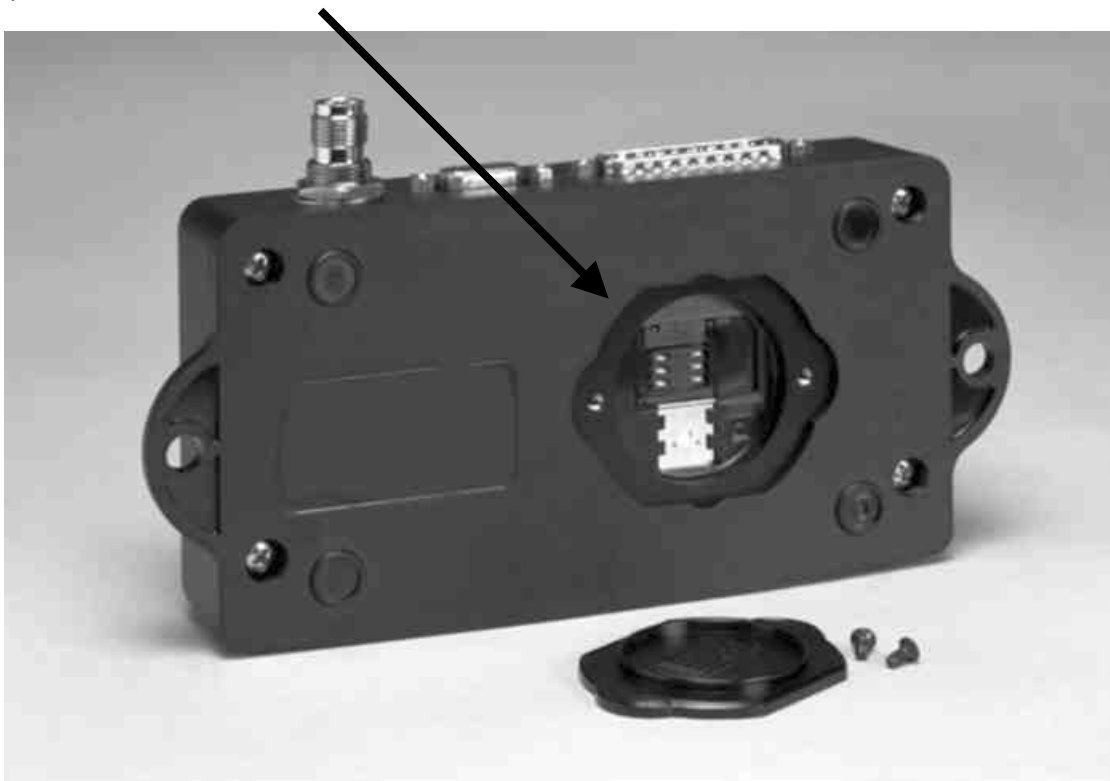
Figure 4-1 - Location of SIM card

Care should be taken to ensure that the card is correctly fitted and is held in place. This is accomplished by fitting the card (with the gold area facing downwards) underneath the two lugs and then **sliding the metal holder over the top of the card to secure it.**
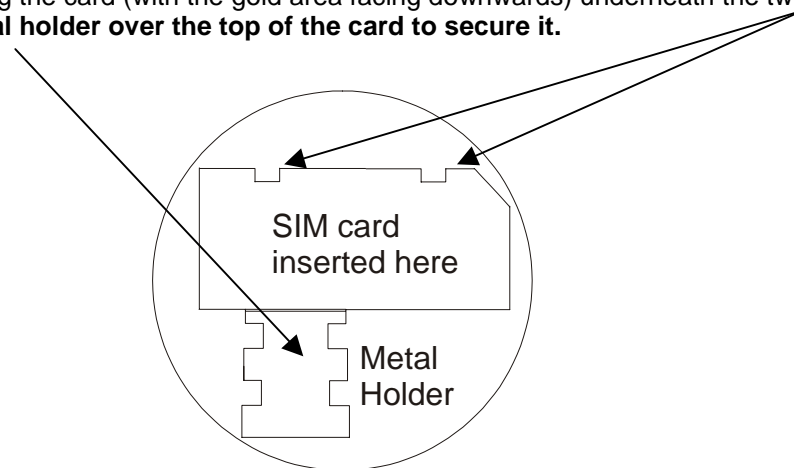
The lid can now be attached and held in place with the two screws.

Figure 4-2 - Securing of SIM card

4.3 Turning on the modem

To turn on the modem, connect power between pin 16 (+9V to +28VDC) and pin 17 (GND) of the D25 connector. Alternatively, fit accessory cable CA8360 and connect power between the red and black leads. Connect a suitable antenna; the Maxon CA8401 is ideal.

Note: It is important that the antenna ground is not connected to the modem ground. This will not happen where through glass antennas are used. Antennas, which are through chassis mounting <u>and connect to the vehicle chassis should not be used</u>. Failure to observe this may result in damage to the unit and will invalidate the warranty.

Pin 15 of the D25 connector has to be pulled LOW in order to turn on the modem. Alternatively, fit accessory cable CA8360 and connect the green lead to GND.

Provided that the SIM card is unlocked, the modem will make an automatic search for your home network or another suitable network operator in your location. The modem will initially flash RED as it establishes a network connection (within seconds) and then flash GREEN.

Note: To prevent unauthorised use, the SIM can be protected by a PIN code (See Section 5.1.40). Each time the modem is switched on the PIN code must be entered. If you enter the wrong code, three times in succession, your SIM will be barred from the network and the modem will require a PUK code.

4.4 V.24 Interface

The modem is set to communicate with a baud rate, which is set as default to 19200 baud. The modem does not support autobaud and therefore it is important that any equipment, which communicates with the modem, is set to 19200 baud.

4.5 Set up the appropriate software

Information is provided in Section 8.2 for setting up Hyper Terminal and TAPI devices for use with the modems.

4.6 Confirming Operation

On Hyper Terminal, type ATD <Telephone number you want to ring> and press Carriage Return.

The telephone will ring. The answer tone will be similar to the one, which you would receive, with a fax machine.

4.7 Summary

This section has covered the basic operation of the modem.

5 AT COMMANDS

Command	Function	Paragraph	
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Command	Function	Paragraph	
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AT+DS	Data compression mode	5.1.48	Page 28
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5.1.1 +++<CR> - Escape command

By sending the escape sequence +++<CR>, the modem will return to AT command mode. Then you can send the ATH command for automatic termination of the connection:

Enter	Response
+++<CR>	OK
	Notes: None
	Result codes: None

5.1.2 A – Re-execute last command

The A/command lets you re-execute the last command entry. This command is not preceded by AT and does not have to end with <CR>:

Enter	Response
ATD12345678<CR>	BUSY
A/	ATD12345678 (Re-executes the last AT command
	Notes: None
	Result codes: None

5.1.3 ATA – Manually answer an incoming call

The modem does not automatically answer an incoming call (Default setting). The ATA command causes the modem to go off-hook when the modem rings:

Enter	Response
ATA	The modem will answer the incoming call
	Notes: None
	Result codes: None

5.1.4 ATD – Dial a telephone number

This command will dial the number entered after the ATD command:

Enter	Response
ATD12345678<CR>	The modem dials the telephone number 12345678 Connect 14400 (Selected speed)
	Notes: As soon as the modem detects the carrier from the GSM base station, it returns the CONNECT result code. Data transmission can now begin. The following characters are valid in a dial string: The digits from "0" to "9", and "+" for making International calls. The + must be at the beginning of the number.
	Result codes: ERROR NO CARRIER CONNECT<selected speed> Mobile equipment result code

5.1.5 ATDL

This command will dial the last number, which the modem dialled:

Enter	Response
ATDL<CR>	12345678 where 12345678 was the last number dialled. Connect 14400 (Selected speed)
	Notes: None
	Result codes: ERROR NO CARRIER CONNECT<selected speed> Mobile equipment result code

5.1.6 ATE – Command Echo

This command is used to enable and disable echo.

Enter	Response
ATE0	Disable echo.
ATE1	Enable echo.
	Notes: None
	Result codes: OK ERROR

5.1.7 ATH – Hang up

This command is used for asynchronous transmission only. If the user returns from data mode to command mode after sending an escape sequence (+++) or after disabling the DTR signal with AT&D1 option, the modem can be forced to disconnect by sending the ATH command.

Enter	Response
ATH	
	Notes: None
	Result codes: OK ERROR

5.1.8 ATIn - Identification

This command provides information about the product identification.

Enter	Response
ATIn	Mode
ATI0	Product Code
ATI1	Pre-computed checksum
ATI2	Returns OK
ATI3	Returns OK
ATI4	OEM String
ATI5 to I11	Returns OK
ATI12	ROM Checksum
ATI13	RC Version number
ATI14	Shows firmware version
ATI15	Shows selected country
ATI17	GSM option
	Notes: None
	Result codes: OK ERROR

5.1.9 ATO0 – Return to transparent mode (switch from command mode to data mode).

If you wish to interrupt the data flow only briefly, you can use the ATO0 command to return your modem to the transparent mode, i.e. the data flows once again.

Enter	Response
ATO0	
	Notes: None
	Result codes: OK ERROR

5.1.10 ATQ - Result code suppression

This command is used to enable and disable the result code.

Enter	Response
ATQ0 **ATQ1**	Enable result code Disable result code
	Notes: None
	Result codes: OK ERROR

5.1.11 ATS0=n – Auto-answer mode

Enter	Response
ATS0=0 **ATS0=1** **….etc.** **ATS0=5** **ATA**	No auto-answer, incoming calls are ignored (Default value). The modem will answer incoming calls after the first ring. The modem will answer incoming calls after the fifth ring. The modem will answer the incoming call.
	Notes: The ATA command can still be used regardless of the value of the ATS0=n string. The S0 register can be read out by the ATS0? command, the modem will then display the current value.
	Result codes: OK ERROR

5.1.12 ATS1? – Number of rings

Displays the number of rings, which the modem has detected. This register is cleared when no rings occur for 8 seconds, or when the value becomes equal to S0.

5.1.13 ATS2- Escape character

Typing ATS2? will display the decimal value of the ASCII character used as the escape character. The default value (43) corresponds to an ASCII <+>. The value 127 disables the escape process.

Enter	Response
ATS2=127 ATS2=43	Disables the escape process. Sets + as the escape character (default).
	Notes: None
	Result codes: None

5.1.14 ATS3 – Command line termination character

Typing ATS3? will display the decimal value of the ASCII character used as the carriage return character. The default value (13) corresponds to an ASCII <CR>. Affects asynchronous operation only.

Enter	Response
ATS3=13	Sets CR as the command line termination character (default).
	Notes: Setting any other value than 13 may cause problems when entering commands.
	Result codes: None

5.1.15 ATS4 – Line Feed character

Typing ATS4? will display the decimal value of the ASCII character used as the line feed character. The default value (10) corresponds to an ASCII <LF>. Affects asynchronous operation only.

Enter	Response
ATS4=10	Sets LF as the line feed character (default).
	Notes: None.
	Result codes: None

5.1.16 ATS5 – Backspace character

Typing ATS5? will display the decimal value of the ?ASCII character used as the backspace character. The default value (8) corresponds to an ASCII <backspace>. Affects asynchronous operation only.

Enter	Response
ATS5=8	Sets backspace as the backspace character (default).
	Notes: None.
	Result codes: None

5.1.17 ATS6 – Pause before blind dialling

The value of this register is ignored.

5.1.18 ATS7 – Wait time for carrier

After dialling, this register sets the time that the modem must wait before hanging up if it fails to detect the remote carrier. Time is in seconds.

Enter	Response
ATS7=60	Sets the wait for carrier time to 60 seconds (default).
	Notes: None.
	Result codes: None

5.1.19 ATS8 – Wait time before dialling

Sets the number of seconds to wait when the comma dial modifier is encountered in the dial string.

Enter	Response
ATS8=2	Sets the wait time before dialling to 2 seconds (default).
	Notes: None.
	Result codes: None

5.1.20 ATS10 – Wait time before disconnection

Set the number of tenths of seconds to wait before disconnecting after the modem has indicated the absence of the received line signal.

Enter	Response
ATS10=15	Sets the wait time before disconnection to 15 seconds (default).
	Notes: None.
	Result codes: None

5.1.21 ATS12 – Escape code guard time

Defines the maximum silence time, in fiftieths of a second, accepted between two characters in an escape sequence.

Enter	Response
ATS12=10	Sets the escape code guard time to 0.2 seconds (default).
	Notes: None.
	Result codes: None

5.1.22 ATV – Results code format

This command is used to select short or long result codes.

Enter	Response
ATV0 ATV1	Sets short result codes. Sets long result codes.
	Notes: None.
	Result codes: OK ERROR

5.1.23 ATX – Defines CONNECT results code format

This command is used to define the result code for CONNECT.

Enter	Response
ATX0 ATX1	Modem returns only the CONNECT code as soon as a satisfactory connection has been set up. Modem returns only the CONNECT<SPEED> code as soon as a satisfactory connection has been set up.
	Notes: ATX2, 3 & 4 perform the same function as ATX1.
	Result codes: None

5.1.24 ATZ – Load user profile

This command will load a user-defined profile.

Enter	Response
ATZ0	User profile 0 is loaded.
	Notes: None.
	Result codes: OK ERROR

5.1.25 AT&C – Data carrier detect options

This command affects the DCD line connected to the serial port.

Enter	Response
AT&C0 AT&C1	Sets the GSM module DCD control line to ON regardless of the data carrier status of the distant station. DCD specifies the data carrier status of the distant station. DCD on indicates that a connection exists.
	Notes: None.
	Result codes: OK ERROR

5.1.26 AT&D – Data Terminal Ready options

This command affects the DTR line connected to the serial port.

Enter	Response
AT&D1 AT&D2	The modem changes to the command mode when the DTR line switches from ON to OFF. The modem sets up a connection to the distant station, switches to command mode and deactivates auto-answer mode when the DTR line switches from ON to OFF. Auto-answer can be re-activated by resetting DTR to ON.
	Notes: None.
	Result codes: OK ERROR

5.1.27 AT&F – Restore default configuration

This will force the modem to load the default configuration.

Enter	Response
	Notes: None.
	Result codes: OK ERROR

5.1.28 AT&V – Display current configuration

The modem will display the current configuration.

Enter	Response
	Notes: None.
	Result codes: OK ERROR

5.1.29 AT&W – Save current configuration

This command will allow you to save the current configuration.

Enter	Response
	Notes: None.
	Result codes: OK ERROR

5.1.30 AT+CBSTs,m,p – Select bearer service type

Selects the bearer service to be used when data calls are originated.

S	Speed
0	Not supported
1	300bps / V.21
2	1200bps / V.21
3	1200/75bps / V.21
4	2400bps / V.22 bis
5	2400bps / V.26 ter
6	4800bps / V.32
7	9600bps / V.32
65	300bps / V.110
66	300bps / V.110
68	2400bps / V.110
70	4800bps / V.110
71	9600bps / V.110
M	Mode
0	Asynchronous
P	Protocol
0	Transparent
1	Non-transparent
Enter	Response
AT+CBST?	The modem will reply with the selected speed, mode and protocol.
AT+CBST=?	The modem will reply with the supported speeds, modes and protocols.
	Result codes OK ERROR

5.1.31 AT+CEER – Displays why last call was disconnected

This command lets you query the reason why the last call was disconnected.

Enter	Response
	Notes: None.
	Result codes: OK ERROR

5.1.32 AT+CMGD – Delete messages

This command is used to delete a received stored SMS message.

Enter	Response
AT+CMGD=<index>	Delete SMS entry corresponding to <index> where <index> is the location in memory.
	Notes: None.
	Result codes: OK ERROR Message service failure result codes.

5.1.33 AT+CMGF – Message format

This command allows you to define the input and output format of the short message.

Enter	Response
AT+CMGF=0	Set to PDU mode, a complete SMS message including all header information is passed as a binary string.
AT+CMGF=1	Set to text mode, all commands and responses are in ASCII characters.
AT+CMGF=?	Displays all supported values.
	Notes: None.
	Result codes: OK ERROR Message service failure result codes.

5.1.34 AT+CMGL – List messages

This command is used to list the SMS messages stored in the modem.

Enter	Response
AT+CMGL=<STAT> Where <STAT> In text mode:	
"REC UNREAD"	Receive unread messages.
"REC READ"	Stored read messages.
"STO UNSENT"	Stored unsent messages.
"STO SEND"	Stored sent messages.
"ALL"	All messages
In PDU mode:	
0	Received unread messages
1	Stored read messages
2	Stored unsent messages
3	Stored sent messages
4	All messages
AT+CMGL::<index>,<stat>,<da>,<CR>,<LF>,<data>	
Where <data>	TP user data GSM 03.40
<da>	Destination Address type value according to GSM 03.40.
<index>	Location in memory.
AT+CMGL=?	Displays the supported values.
	Notes: None.
	Result codes: OK ERROR Message service failure result codes.

5.1.35 AT+CMGR – Read messages

This command is used to read SMS messages.

Enter	Response
AT+CMGR=<index>,<data> Where	
<index>	Integer indicating the location of the SMS to be read.
<data>	TP user data GSM 03.40
	Notes: None.
	Result codes: OK ERROR Message service failure result codes.

5.1.36 AT+CMGS – Send messages

This command is used to send SMS messages.

Enter	Response
In text mode: AT+CMGS="Receiver number"<CR><text to be sent>CtrlZ In PDU mode: AT+CMGS=<length><CR><pdu>CtrlZ/esc Where	OK
<length>	Number of characters in text mode, or length of binary string in PDU mode.
<pdu> AT+CMGS<mr>	Binary string coded according to GSM 03.38
Where <mr>	Message reference according to GSM 03.40.
	Notes: Esc quits without sending.
	Result codes: OK ERROR Message service failure result codes.

5.1.37 AT+CMGW – Write messages to memory

This command is used to store a SMS message into the memory.

Enter	Response
In text mode: AT+CMGW=<oa/da><CR><text to be stored>CtrlZ/esc In PDU mode: AT+CMGW=<length><CR><pdu is given>CtrlZ/esc Where <da> <length>	 TP – Destination Address. Address value field in string format GSM 03.40. Number of characters in text mode, or length of binary string in PDU mode.
	Notes: Esc quits without sending.
	Result codes: OK ERROR Message service failure result codes.

5.1.38 AT+CMSS – Send messages from storage

This command is used to send a stored SMS message.

Enter	Response
AT+CMSS=<index>[,<da>,<toda>] Where <da> <index> <mr> <toda>	Sends message stored in location corresponding to <index>. OK TP – Destination Address. Address value field in string format GSM 03.40. Location in memory Message reference according to GSM 03.40. Integer format of <da>.
	Notes:
	Result codes: OK ERROR Message service failure result codes.

5.1.39 AT+CNMI – New Message

This command allows you to determine how the modem shall notify the user when a SMS message is received from the network operator.

Enter	Response
AT+CNMI=<mode>,<mt>,<bm>,<ds><bfr>	Set message indication mode.
AT+CNMI?	Display current values +CNMI<mode>,<mt>,<bm>,<ds>,<bfr>
AT+CNMI=?	Display list of supported values. +CNMI<mode>,<mt>,<bm>,<ds>,<bfr>
Where <mode>	Buffer unsolicited result code modem. If buffer is full, the oldest indications may be discarded and replaced with the new received indication. Discard indication and reject new received messages unsolicited result codes when serial port is in use. Otherwise forward them directly to the user. Buffer unsolicited result codes in the modem when the serial link is in use and deliver them when the serial link is unused. Forward unsolicited result codes directly to the user. Serial link specific in-band used to embed result codes as data when the modem is in on-line mode.
<mt>	Disable SMS-deliver indication. If SMS-deliver is stored in modem, indication of memory location routed to the user using +CMTI<mem>,<index> indication that new message has been received. SMS deliveries are routed directly to the user. Class 3 SMS deliveries are routed directly to the user.
<bm>	No CBM, Cell Broadcast Message, is routed to the user. If CBM, Cell Broadcast Message, is stored in modem, indication of memory location is routed to the user using the +CBMI<mem>,<index>. SMS status disabled. SMS status report enabled.
<bfr>	The results codes buffered in the modem are sent to the user when mode 1…3 is entered. The result code is cleared when mode 1…3 is entered.
	Notes:
	Result codes: OK ERROR Message service failure result codes. +CMTI<mem>,<index> indication that new messages has been received. +CBMI indication of new cell broadcast

5.1.40 AT+CPIN – Enter PIN and query blocks

This command is used to validate the PIN code, or to validate the PUK code.

Enter	Response
AT+CPIN?	Displays the current status of the PIN code.
AT+CPIN=<puk>,<new_pin>	If PUK code is required. New_pin will be the new pin code for the SIM card.
AT+CPIN=<pin>	Enter the PIN code for the SIM card.
	Notes:
	Result codes: OK ERROR +CPIN READY +CPIN SIM PIN "Pin code required" +CPIN SIM PUK "PUK code required" +CPIN SIM PIN2 "Pin 2 code required" Mobile equipment result code

5.1.41 AT+CR – Cellar result code for outgoing calls

AT+CR=?

5.1.42 AT+CRC – Cellar result code

This command controls whether or not the extended format of incoming call indication is used. When enabled the modem will then send an extended string instead of the usual RING.

AT+CRC can have the value 0 or 1. If set to 0 the cellar result code will be disabled, and 1 will enable the result code.

Enter	Response
AT+CRC=?	Displays the mode selected: +CRING:ASYNC For asynchronous transparent +CRING:REL ASYNC For asynchronous non-transparent +CRING:SYNC For synchronous transparent +CRING:REL SYNC For synchronous non-transparent +CRING:VOICE For normal speech +CRING:FAX For fax calls
	Notes:
	Result codes: OK ERROR

5.1.43 AT+CRLP – Radio Link Protocol parameters

This command lets you change parameters for the radio link protocol, used only for NON-transparent data transmission.

Enter	Response
AT+CRLP=<up-window size>,<down window size>,<acknowledgement timer>,<retransmissions attempts>,<reset allowed>,<re-sequencing time>	
AT+CRLP?	Displays the current settings.
AT+CRLP=?	Displays the supported settings.
	Notes: None
	Result codes: OK ERROR

5.1.44 AT+CSCA – Service centre address

This command shall be used to indicate to which service centre the message has to be sent.

The modem has no default value for this address. If a SMS is sent without having indicated the service address, an error will be generated.

Enter	Response
AT+CSCA="<sca>" Where <sca>	GSM 04.11 RP SC address address-values field string format.
AT+CSCA?	Displays the current value.
	Notes: None
	Result codes: OK ERROR Message service failure result codes

5.1.45 AT+CSDH – Show test mode parameters

This command is used to determine if a detailed header information is shown in text mode result codes.

Enter	Response
AT+CSDH=0	Disable header information.
AT+CSDH=1	Enable header information
AT+CSDH?	Displays the current value.
AT+CSDH=?	Displays the supported values
	Notes: None
	Result codes: OK ERROR Message service failure result codes

5.1.46 AT+CSMP – Set text mode parameters

This command is used to select additional values, when a SMS is sent to the network, or placed in storage, when text format.

Enter	Response
AT+CSMP=<fo>,<vp> Where <fo> Where <vp>	+CSMP<fo>,<vp> The first octet of SMS-SUBMIT of GSM03.40 Validity period of the message in integer format.
	Notes: None
	Result codes: OK ERROR Message service failure result codes

5.1.47 AT+DR – Data compression report

This command is used to determine whether or not the intermediate result code of the current data compression is reported after a connection set-up.

Enter	Response
AT+DR=0 AT+DR=1 AT+DR? AT+DR=?	Disable reporting Enable reporting Displays the current value Displays the supported values.
	Notes: None
	Result codes: OK ERROR +DR<type> Where <type> NONE Data compression is not used. V42B Rec. V42bis for both directions B42BRD Rec. V42bis for receive direction only B42BTD Rec. V42bis for transmit direction only

5.1.48 AT+DS – Data compression mode

This command is used to determine the possible data compression mode between the modem and the compression negotiation with the remote modem after call set-up.

Enter	Response
AT+DS=<p0>,<n>,<p1>,<p2>	
Where <p0>	
0	None
1	Transmit only
2	Receive only
3	Both directions, but allow negotiation
Where <n>	
0	Allow negotiation of <p0> down
1	Don't allow negotiation of <p0 down, disconnect if difference
Where <p1>	
512 – 1024	Dictionary size
Where <p2>	
6 - 64	Maximum string
AT+DS?	Displays the current value.
AT+DS=?	Displays the supported values.
	Notes: None
	Result codes: OK ERROR

5.1.49 AT+FCLASS – Select, read or test service class

This command is used to toggle between fax and data commands.

Enter	Response
AT+FCLASS=0	Set to data mode
AT+FCLASS=1	Set to fax mode
AT+FCLASS?	Displays the current value
AT+FCLASS=?	Displays the supported values
	Notes: None
	Result codes: None

5.1.50 AT+FMI – Report manufacturer ID

This command provides the name of the module manufacturer.

Enter	Response
	Notes: None
	Result codes: OK ERROR

5.1.51 AT+FMM – Report module ID

This command provides the name of the module.

Enter	Response
	Notes: None
	Result codes: OK ERROR

5.1.52 AT+FMR – Report revision

This command provides the version of the module and the software creation date.

Enter	Response
	Notes: None
	Result codes: OK ERROR

5.1.53 AT+FRH – Receive HDLC data with carrier

Receive data with HDLC Framing. +FRH=n causes the modem to transmit data using HDLC protocol and the modulation defined below. An ERROR response code results if this command is issued while the modem is on-hook.

Enter	Response
AT+FRH=<mod> Where <mod> 3	V.21 300bps
AT+FRH=?	Displays supported values
	Notes: None
	Result codes: OK ERROR

5.1.54 AT + FRM – Receive data with carrier

Enter	Response
AT+FRM=<mod> Where <mod> 24 48 72 96	 V.27 ter 2400bps V.27 ter 4800bps V.29 7200bps V.29 9600bps
AT+FRM=?	Displays supported values
	Notes: None
	Result codes: OK ERROR

5.1.55 AT+FTH – Transmit HDLC data with carrier

Transmit data with HDLC Framing. +FTH=n causes the modem to receive data using HDLC protocol and the modulation defined below. An ERROR response code results if this command is issued while the modem is on-hook.

Enter	Response
AT+FTH=<mod> Where <mod> 3	 V.21 300bps
AT+FTH=?	Displays supported values
	Notes: None
	Result codes: OK ERROR

5.1.56 AT+FTM – Transmit data with carrier

Transmit data. +FTM=n causes the modem to transmit data using the modulation defined below. An ERROR response code results if this command is issued while the modem is on-hook.

Enter	Response
AT+FTM=<mod> Where <mod> 24 48 72 96	 V.27 ter 2400bps V.27 ter 4800bps V.29 7200bps V.29 9600bps
AT+FTM=?	Displays supported values
	Notes: None
	Result codes: OK ERROR

5.1.57 AT+GMI – Request manufacturer ID

This command provides the name of the manufacturer, i.e. Maxon.

Enter	Response
	Notes: None
	Result codes: OK ERROR

5.1.58 AT+GMM – Request model ID

This command provides the model name, i.e. MM-6854.

5.1.59 AT+GMR – Request revision ID

Enter	Response
	Notes: None
	Result codes: OK ERROR

5.1.60 AT+ICF – Character framing

This command is used to determine the start-stop (asynchronous) character framing that the modem shall use.

Enter	Response
AT+ICF=<format>,<parity> Where <format>	
1	8 data, 2 stop
2	8 data, 1 parity, 2 stop
3	8 data, 1 stop
4	7 data, 2 stop
5	7 data, 1 parity, 1 stop
6	7 data, 1 stop
Where <parity>	
0	Odd
1	Even
2	Mark
3	Space
AT+ICF?	Displays the selected values
AT+ICF=?	Displays the supported values
	Notes: None
	Result codes: OK ERROR

5.1.61 AT+IFC – Local flow control

This command is used to control the operation of local flow control between the modem and equipment interfacing the modem.

Enter	Response
AT+IFC=<DCE_DTE>,<DTE_DCE> Where <DCE_DTE>	
1	None
2	Xon/Xoff local
3	RTS
4	Xon/Xoff global
Where <DTE_DCE>	
0	None
1	Xon/Xoff local
2	CTS
AT+IFC?	Displays the selected values
AT+IFC=?	Displays the supported values
	Notes: None
	Result codes: OK ERROR

5.1.62 AT+ILRR – Display local report rate

This parameter setting determines whether or not an intermediate result code of local rate is reported at connection set-up. The rate is applied after the final result code is transmitted to/ from the modem.

Enter	Response
AT+ILRR=0	Disables reporting of local port rate
AT+ILRR=1	Enables reporting of local port rate
AT+ILRR?	Displays the current selected value
	Notes: None
	Result codes: OK ERROR +ILRR<speed>

5.1.63 AT+IPR – Set terminal equipment data rate

This command is used to set the data rate between the modem and the interfacing equipment.

Enter	Response
AT+IPR=<speed>	Where speeds supported are 300, 600, 1200, 2400, 4800, 9600, 19200, 28800, 38400, 57600
AT+IPR?	Displays the current selected values
AT+IPR=?	Displays the supported values
	Notes: None
	Result codes: OK ERROR

5.1.64 CME ERROR<n>

<n>	
0	Phone failure
3	Operation not allowed
4	Operation not supported
10	SIM not inserted
11	SIM PIN required
12	SIM PUK required
13	SIM failure
16	Incorrect password
26	Dial string too long
30	No network service

5.1.65 CMS ERROR<n>

<n>	
0 – 127	GSM 04.11 values
128 – 255	GSM 03.04 values
300	ME failure
301	SMS service of ME reserved
302	Operation not allowed
303	Operation not supported
304	Invalid PDU mode parameter
305	Invalid text modem parameter
310	SIM not inserted
311	SIM PIN necessary
312	PH-SIM PIN necessary
313	SIM failure
314	SIM busy
315	SIM wrong
320	Memory failure
321	Invalid memory test
322	Memory full
330	SMSC address unknown
331	No network service
332	Network timeout
500	Unknown error

5.1.66 S Register Summary

Register	Function	Default Value
S0	Rings to auto answer	0
S1	Ring counter	0
S2	Escape character	43
S3	CR character termination character	13
S4	LF character	10
S5	Backspace character	8
S6	Pause before blind dialling	2
S7	Wait time for carrier	60
S8	Sets number of seconds to wait when comma dial modifier encountered in dial string	2
S10	Wait time before disconnection	15
S12	Escape code guard time	10

S0 Rings to auto-answer

Defines the number of rings before auto-answering an incoming call. Setting the S0 register to zero will disable the auto answering.

S1 Ring counter

Contains the number of rings the modem has detected. The register is cleared when no rings occur for 8 seconds, or when the value becomes equal to S0.

S2 Escape character

S2 contains the decimal value of the ASCII character used as the escape character. The default value corresponds to an ASCII <+>. The value 127 disables the escape process.

S3 CR character

Sets the command line and result code terminator character. Affects asynchronous operation only.

S4 LF character

Sets the character recognised as a line feed. Affects asynchronous operation only.

S5 Backspace character

Sets the character recognised as backspace. Affects asynchronous operation only.

S6 Pause before blind dialling

The value of this register is ignored.

S7 Wait time for carrier

After dialling, this register sets the time the modem must wait before hanging up if it fails to detect the remote carrier. Time is in seconds.

S8 Wait time before dialling

Sets the number of seconds to wait when comma dial modifier encountered in dial string.

S10 Wait time before disconnection

Sets the number of tenth of seconds to wait before disconnecting after the modem has indicated the absence of received line signal.

S12 Escape code guard time

Defines the maximum silence time, in fiftieths of a second, accepted between two characters in an escape sequence.

5.2 Summary

This section has listed all of the AT commands, which are used by the modem.

6 DEBUGGING & INDICATOR LIGHTS

The modem has a built-in indicator, which can show Red, Green or Yellow and flashes at different speeds according to the status of the modem and battery.

RED: Not connected to the network, or low battery.
GREEN: Connected to the network.
YELLOW: Battery discharging.

Note: In order to extend the battery life, the modem will discharge the battery once a month and then recharge it to full capacity. This process takes around 30 minutes, during which time the modem is not accessible. After around 45 minutes, the battery will be fully charged.

The indicator flashes with the following information:

Normal
In Service   One Flash, Off, One Flash

Information
Missed calls, low battery,   Two Flashes, Off, Two Flashes
SMS messages etc.

Alert
Incoming call   Four Flashes, Off, Four Flashes

6.1 Summary

This section has described the indicator functions on the MM-6854 modem.

7 INSTALLATION

7.1 Introduction

This is an area, which is often overlooked and is, in fact, very important.

Cost and corner cutting are frequently observed in installations and, consequently, reliability suffers and problems are seen.

We can only offer a few suggestions in this document, however, expert help is available from a number of experienced installation companies. Knowledge of the vehicle in which the equipment is being installed is invaluable.

7.2 Antennas

The majority of GSM antennas do not require an additional ground plane. However, it is important that any antennas are installed in the best possible location and, if necessary, provided with a suitable ground plane.

The CA8401 antenna, which Maxon sell as an accessory, is designed for mounting inside of the vehicle. This avoids any problems with car washes or vandalism. Mounting instructions are provided with the aerial.

Ideally, multiple antennas should be separated by a minimum of a wavelength (at the lowest frequency), whilst still retaining a good ground plane for each antenna. For instance, for a 400MHz antenna, the ideal separation should be a minimum of 0.75m from any other antenna.

With the use of composite materials, especially on trucks, materials may have to be used to fabricate a suitable ground plane, if required.

Note: It is important that the antenna ground is not connected to the modem ground. This will not happen where through-glass antennas are used. Antennas, which are through-chassis mounting and connect to the vehicle chassis should not be used. Failure to observe this may result in damage to the unit and will invalidate the warranty.

7.3 Power Sources

It is important that a "clean" source of power is used for the supply to the modem. Ideally, this is achieved by taking the supply directly from the battery terminals. With modern vehicles, getting access to the battery is very difficult and therefore alternative sources have to be found. The next best source is the main fuseboard and then around the steering column.

Frequently, either a large voltage glitch, or total loss of voltage may be observed on some trucks at start-up. The loss of voltage to the GSM data modem is avoided by the use of an internal battery.

It is recommended that star earthing is used for all connections to the –ve terminal of equipment. This avoids the possibility of earth loops.

The power supply should be in the range of +9V to +28VDC.

Maxon can supply, as an accessory, a mains power supply which is capable of powering MM-6854 modems. This power supply has the part number CA6823 and is a 12V, 1A power supply.

7.4 Fusing

It is strongly suggested that fuses for the data modem, and any associated equipment, are located in a place away from the main fusebox. This is to avoid the possibility of the fuses being "borrowed" by the driver for other uses.

A 500mA anti-surge fuse should be used for +12V powering or a 800mA anti-surge fuse used for +24V powering.

7.5 Cabling

Maxon provides a variety of accessories (see Section 8.4) which we recommend are used to interface to the data modem.

The CA8360 interfaces the power and DTR line to the modem.

The CA8361 interfaces the RS-232 connection to the modem.

Alternative, custom made, cables can be produced to customer's requirements for volume orders. Please contact Maxon for further details.

The use of the correct cables removes the need for multiple connections and the possibility of the wireman making an error.

If possible, run RF cables separately from other cables and keep RF cables apart from one another to avoid interference / coupling.

7.6 Fixing

We recommend that the MM-6854 data modem is securely fixed to a surface, either directly, or with a suitable bracket.

The fixing hole dimensions are shown below:

163mm
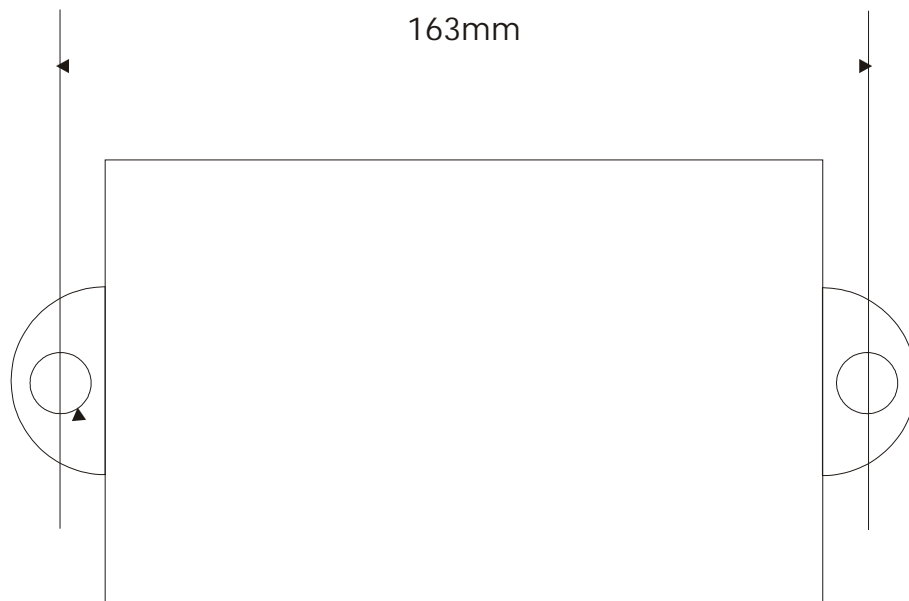
2 off holes 6.7mm dia.

Figure 7-1 - Fixing centres for MM-6854 modem

Note: We do **not** recommend that the data modem is fixed by cable ties to any wiring looms.

7.7 Connections

7.7.1 9 pin D-type (RS-232 Interface)

Pin	Function
1	DCD
2	TXD
3	RXD
4	DTR
5	GND
6	DSR
7	RTS
8	CTS
9	RI

Table 7-1 - 9 pin D-type socket connections

7.7.2 25 pin D-type

Pin	Function
1	GND
2	Software update supply 5.2 to 7.2V
3	Software update programming voltage 0 – 5.2V
4	Software update serial data Rx 0 – 3 V
5	Software update serial data Tx 0 – 3 V
6	Reserved for future use
7	Reserved for future use
8	Reserved for future use
9	Reserved for future use
10	GND
11	Reserved for future use
12	Reserved for future use
13	GND
14	GND
15	Ignition (active low)
16	Power Supply (+9 to +28VDC)
17	Power Supply GND
18	Reserved for future use
19	Reserved for future use
20	Reserved for future use
21	Reserved for future use
22	Reserved for future use
23	Reserved for future use
24	Reserved for future use
25	Reserved for future use

Table 7-2 - 25 pin D-type plug connections

7.8 Summary

This section has briefly covered the installation of the MM-6854 data modem.

8 APPENDICES

8.1 Setting up Windows Modem interface

Follow these step-by-step instructions to set up the Windows Modem interface for use with TAPI interface software (such as WinFax Pro).

8.1.1 Open up the Control Panel
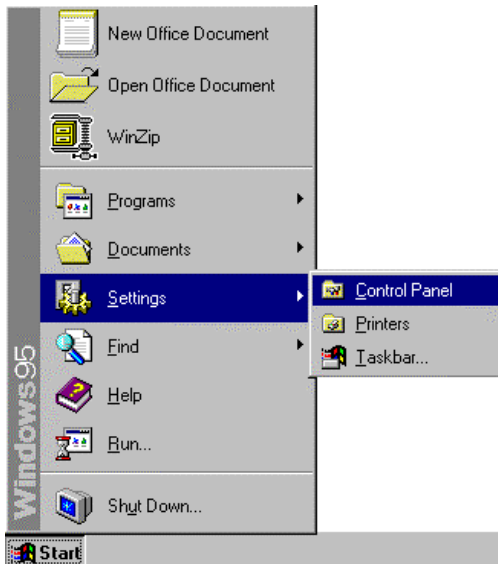
8.1.2 Double click on the modem icon
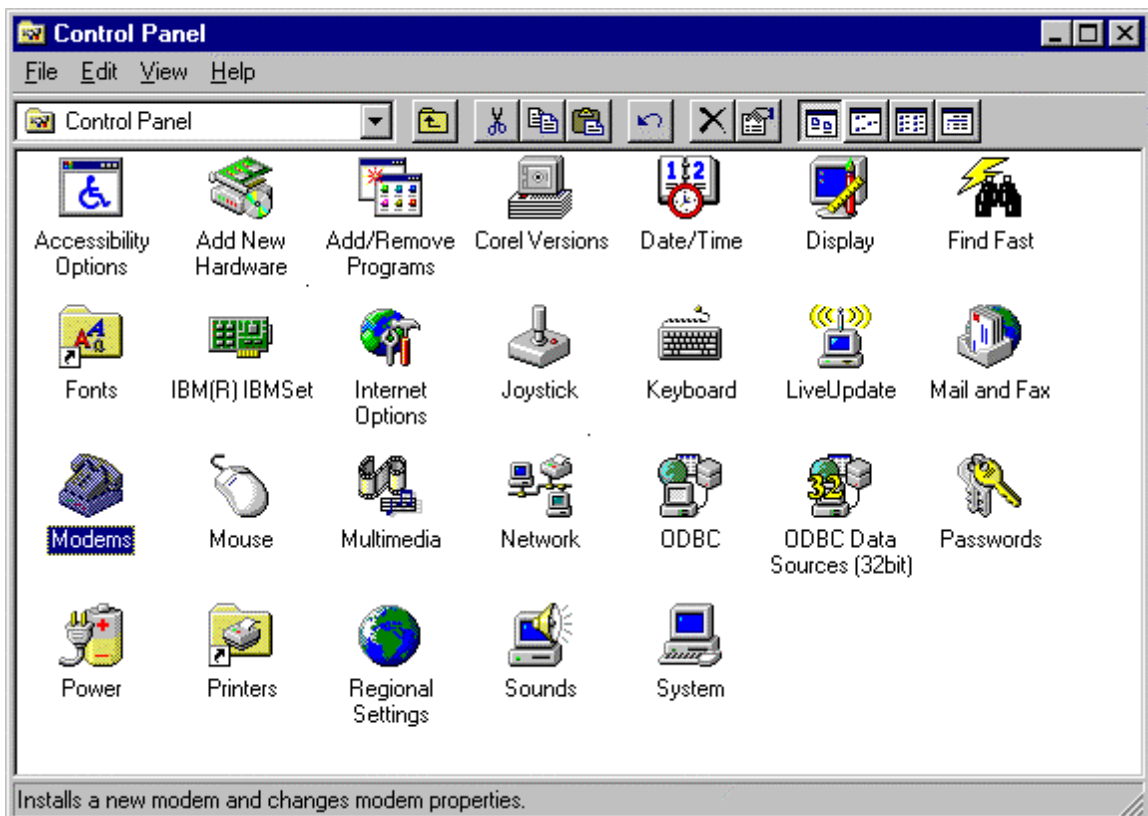
8.1.3 Highlight the don't detect my modem box
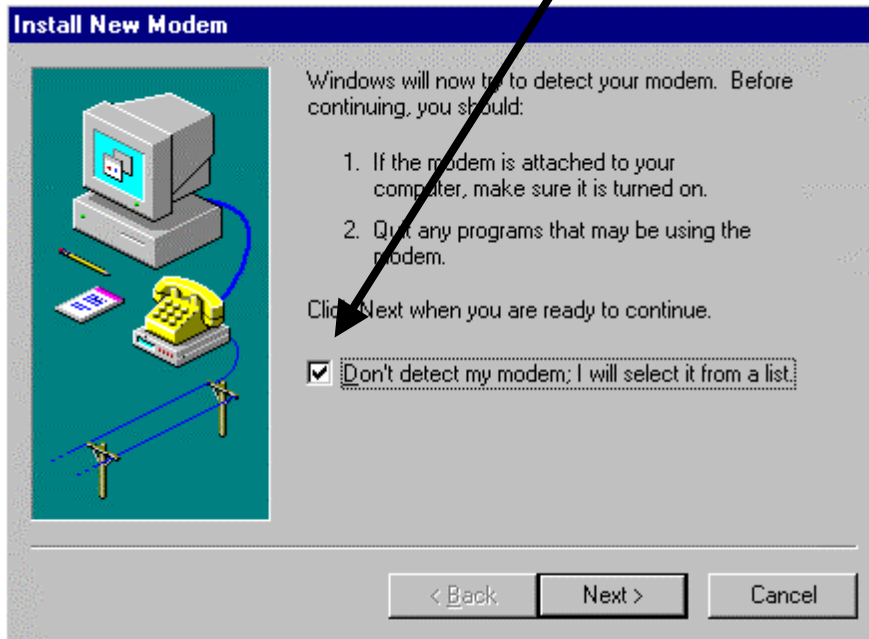
8.1.4 Select the standard 19200 modem
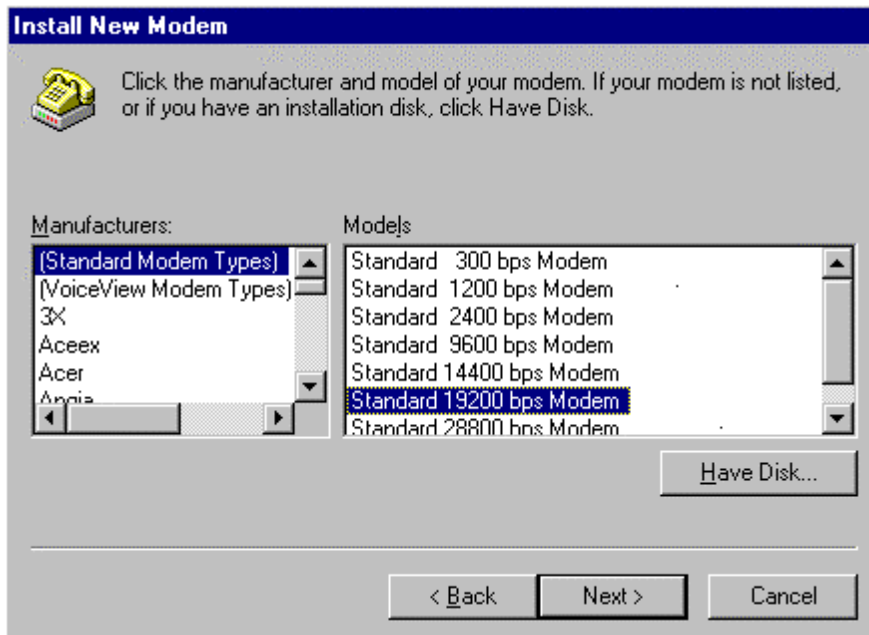
8.1.5 Select the appropriate COM port
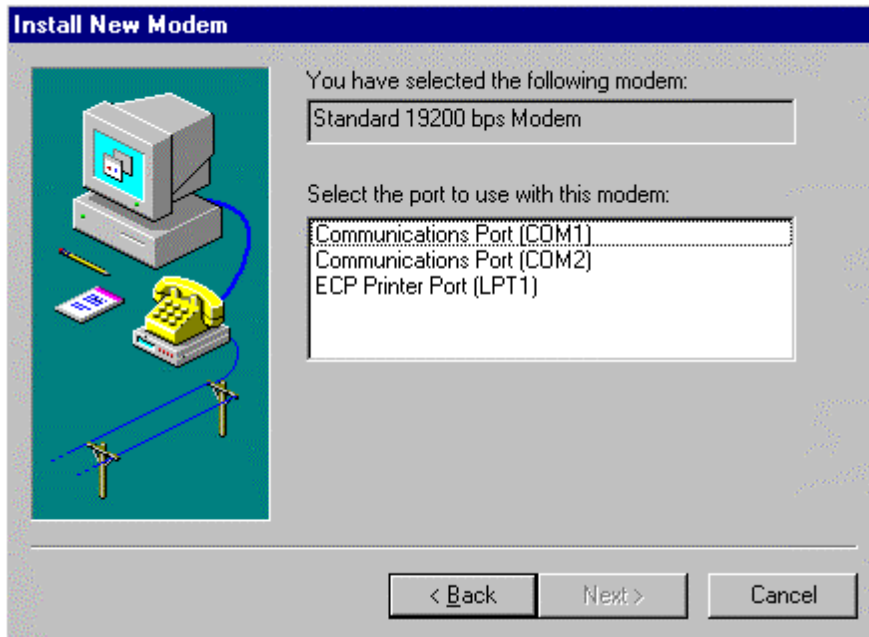
8.1.6 Set the location information

8.1.7 Finish Installation
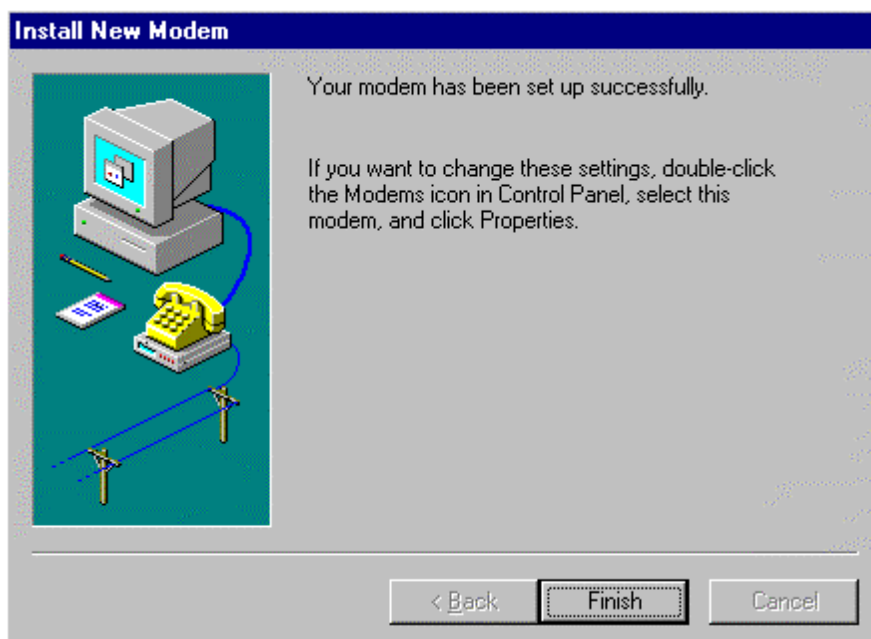
8.1.8 Select Properties
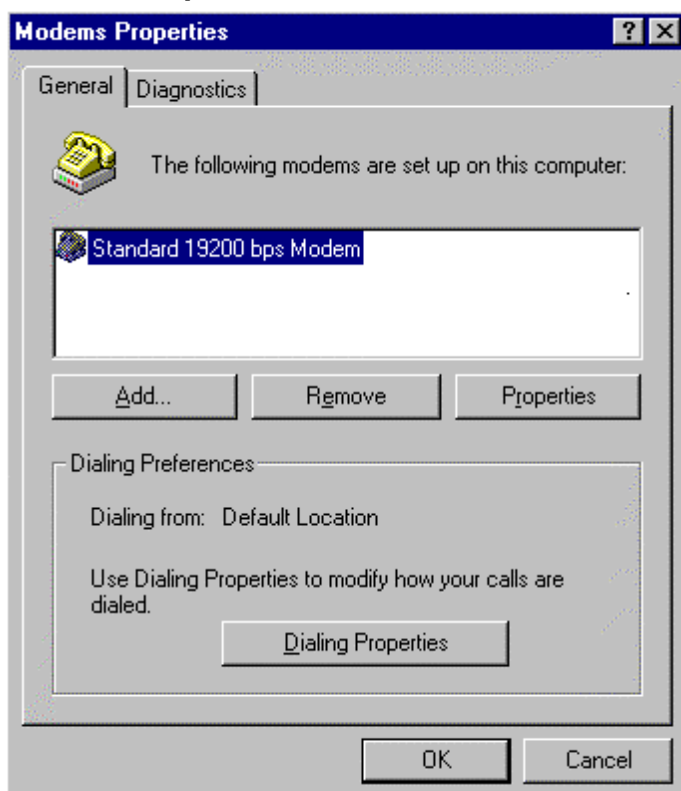
8.1.9 Select Connection
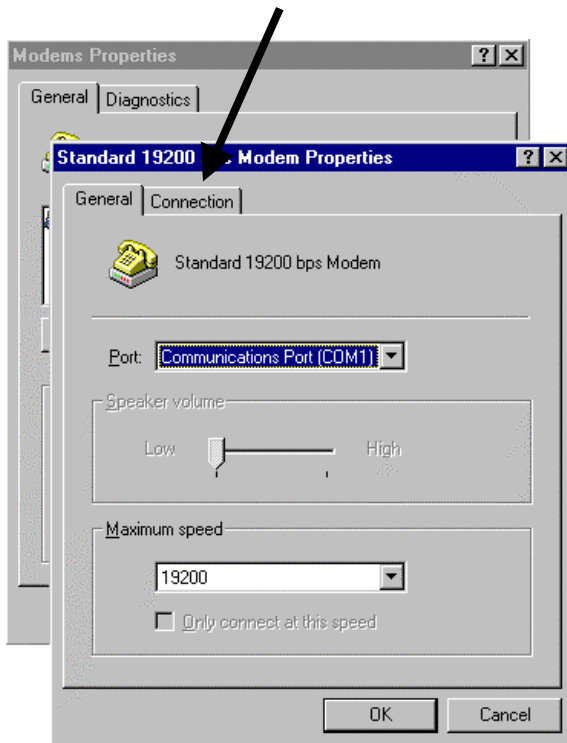
8.1.10 Set Data Bits, Parity and Stop bits
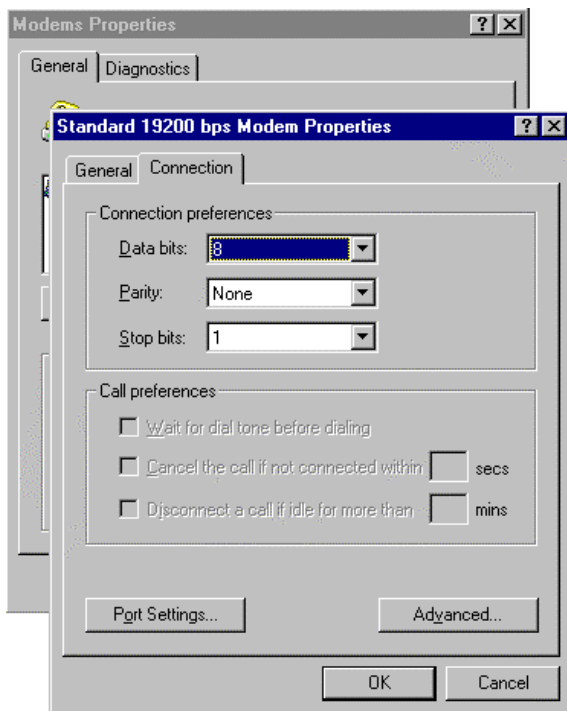
Select Advanced

8.1.11 Select Flow Control and Software (XON/XOFF)
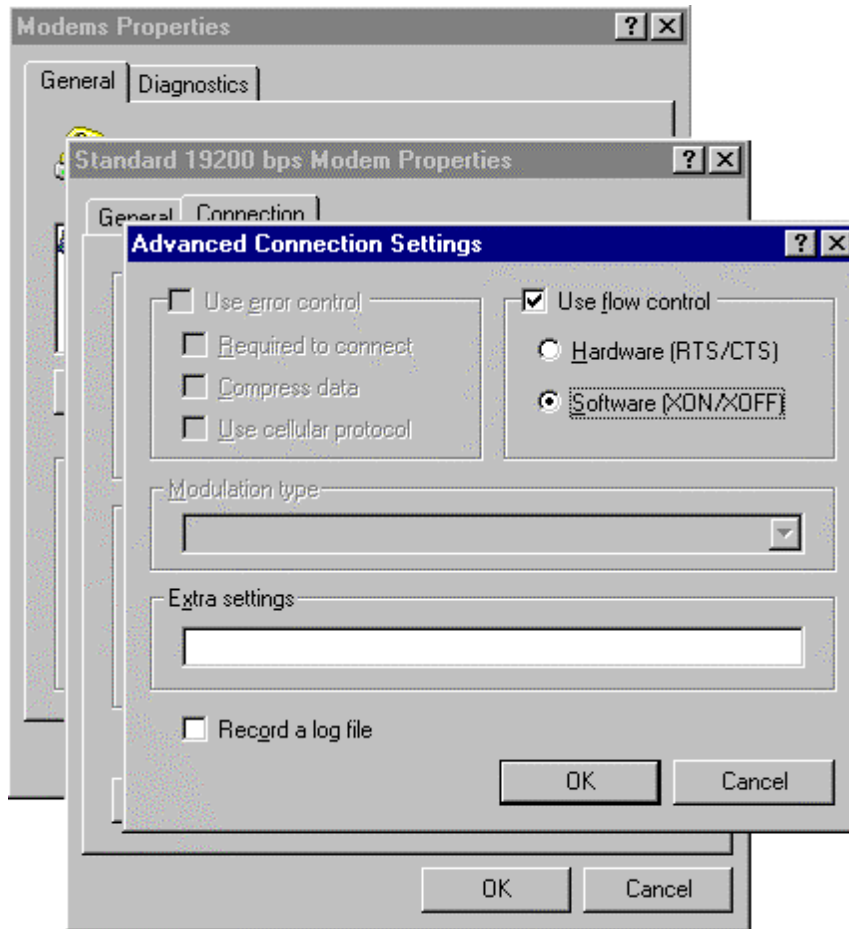
Note: Some applications do not use Software Flow Control, therefore set flow control to Hardware. In whichever case, the hardware or the software **must** provide flow control otherwise data will be lost.

8.1.12 RS-232

In order to turn on the modem, Pin 4 (DTR) must be pulled high. This pin will normally be high on a PC COM port when the COM port is available.

8.2 Setting up Hyper Terminal

Hyper Terminal is a very simple terminal package which can be used to send simple commands to / from the modem.

8.2.1 Select Hyper Terminal from Programs Menu
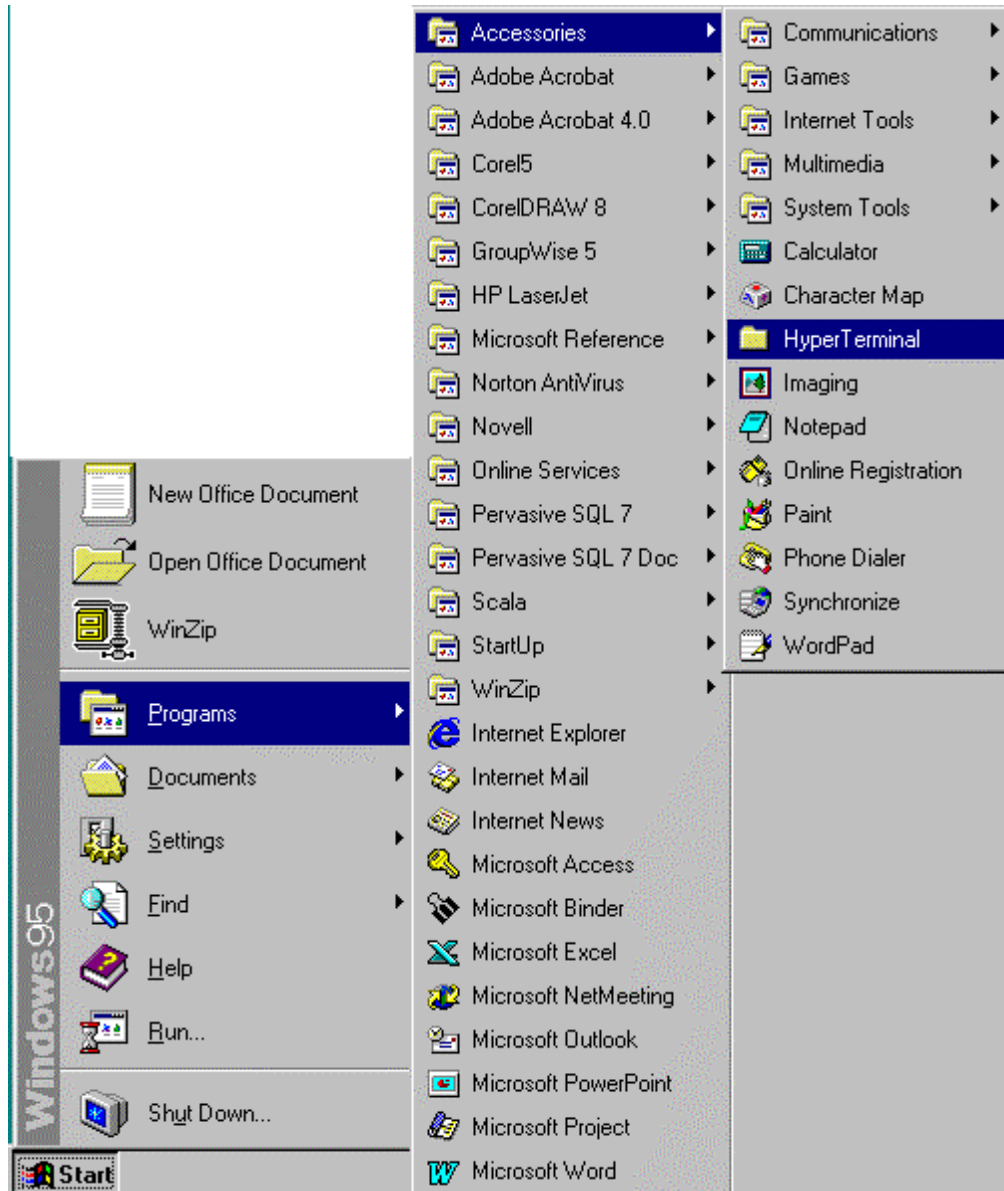
8.2.2 Select Hyper Terminal

Double click to open Hyper Terminal.
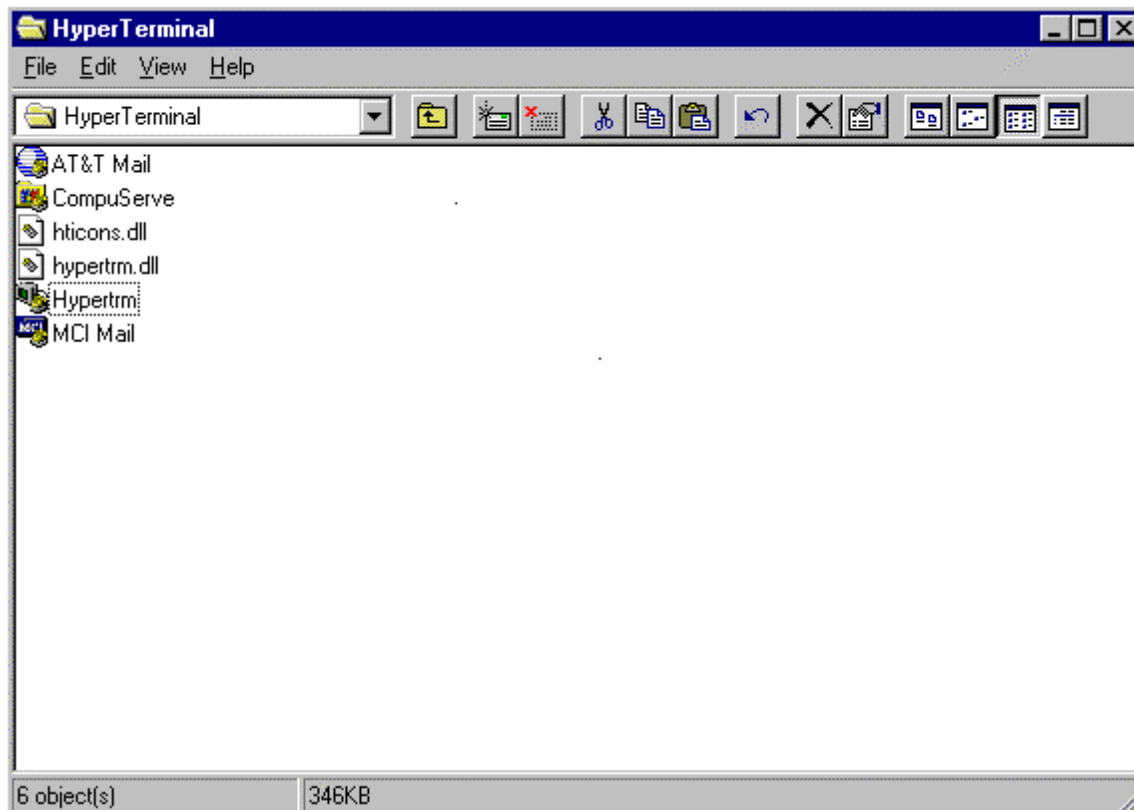
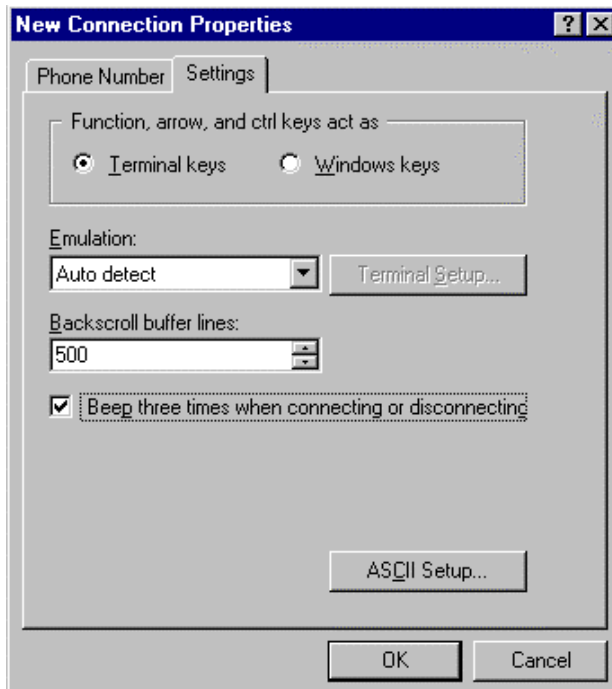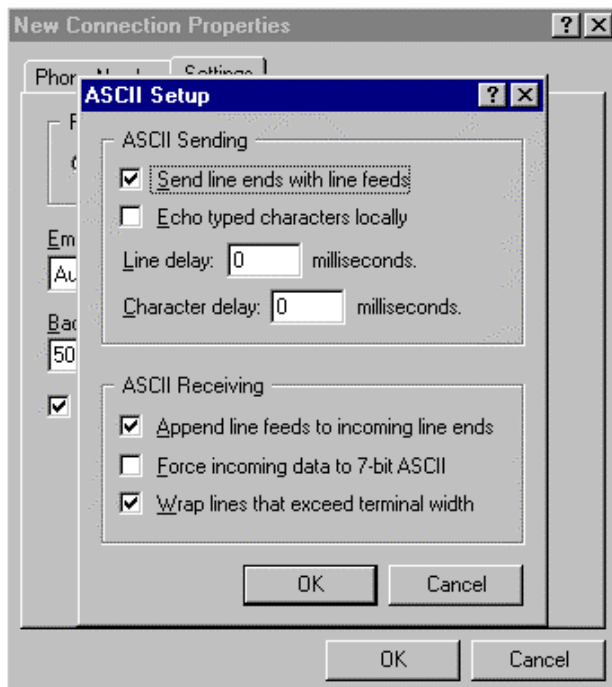### 8.2.3 Select Properties
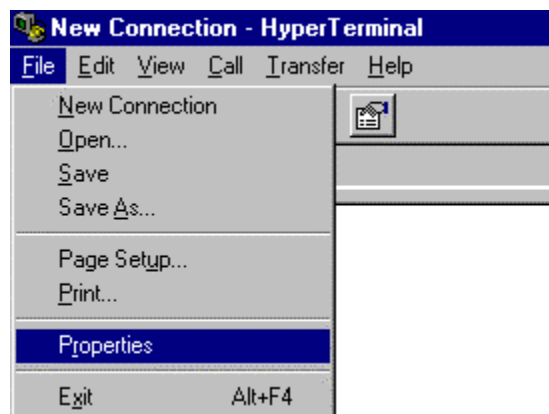
8.2.4 Set Port
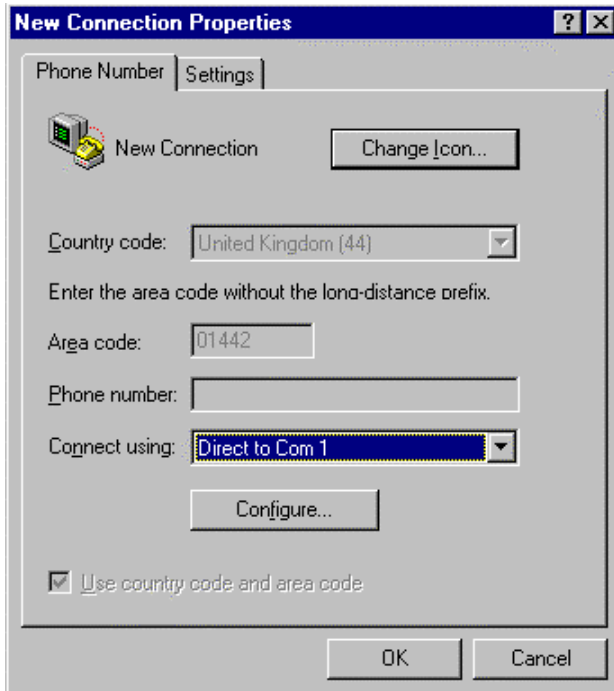
8.2.5 Port Settings
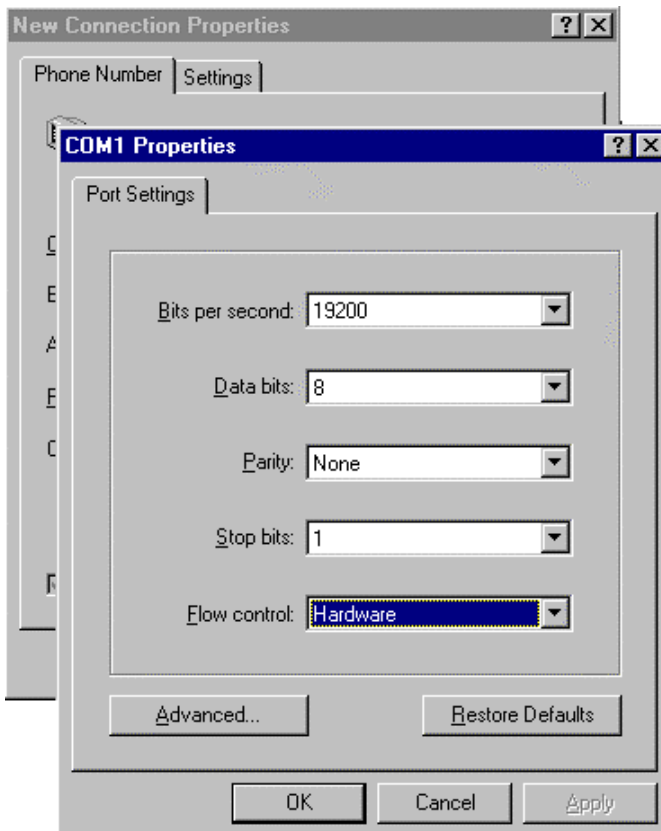
8.2.6 Properties

Set Beep, if required.

8.2.7 ASCII settings

Append line feeds, send line ends and wrap lines, if required.

8.3   Setting up Win Fax Pro

The following section illustrates how to set up Win Fax Pro. Other Fax software is available and this section should not be taken as an endorsement of Win Fax Pro.
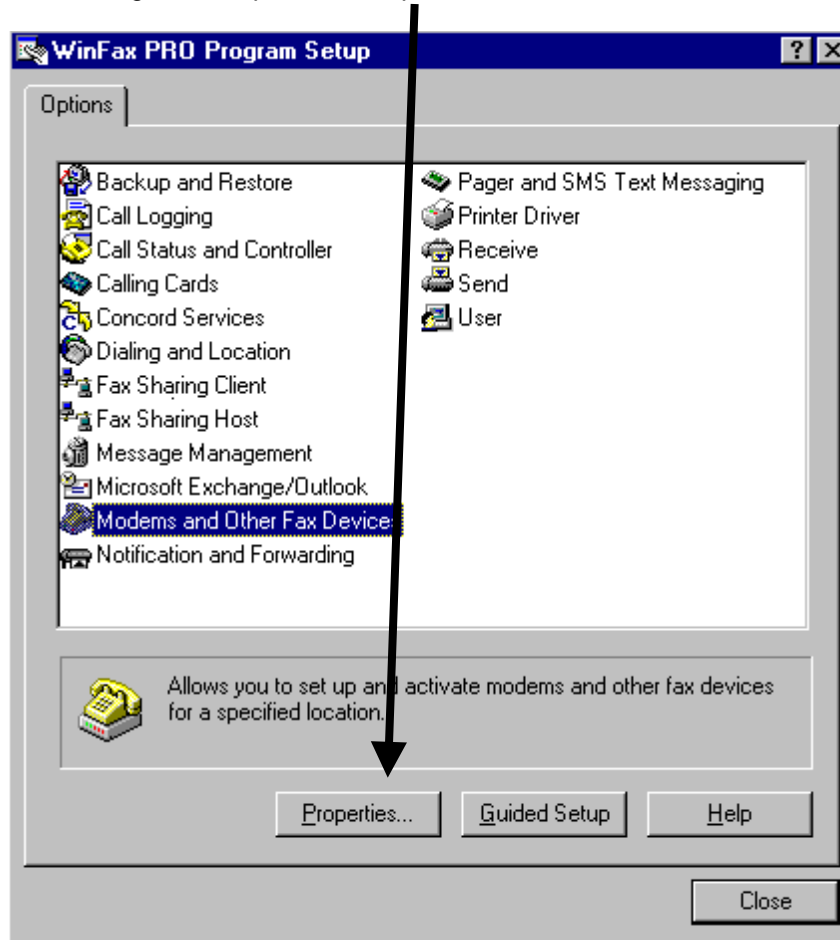
8.3.1   Communication Setup

Ensure that the computer modem settings are set to 19200,8,n,1, see Sections 10.1.9 and 10.1.10.
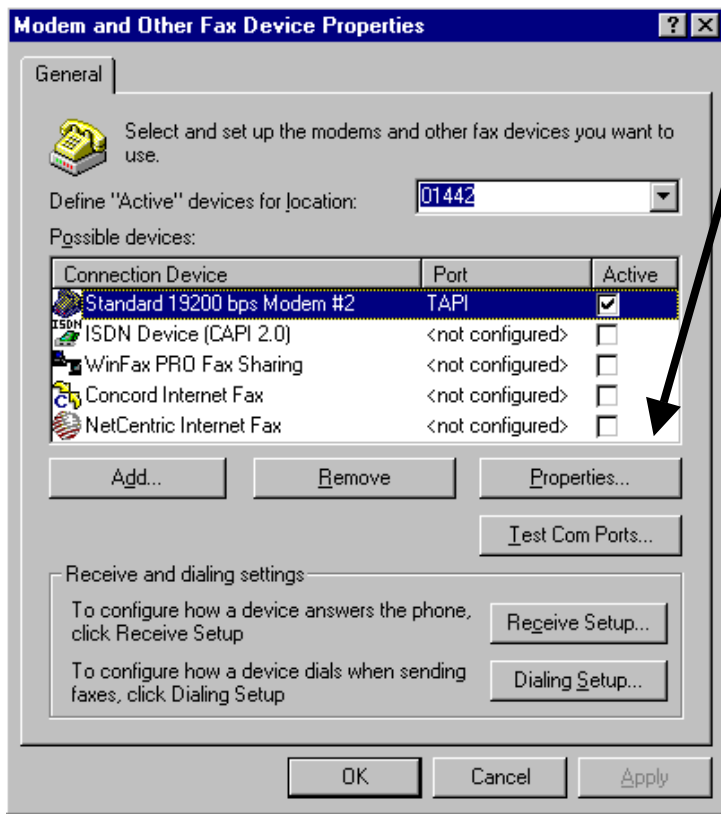
8.3.2   Win Fax Pro Setup

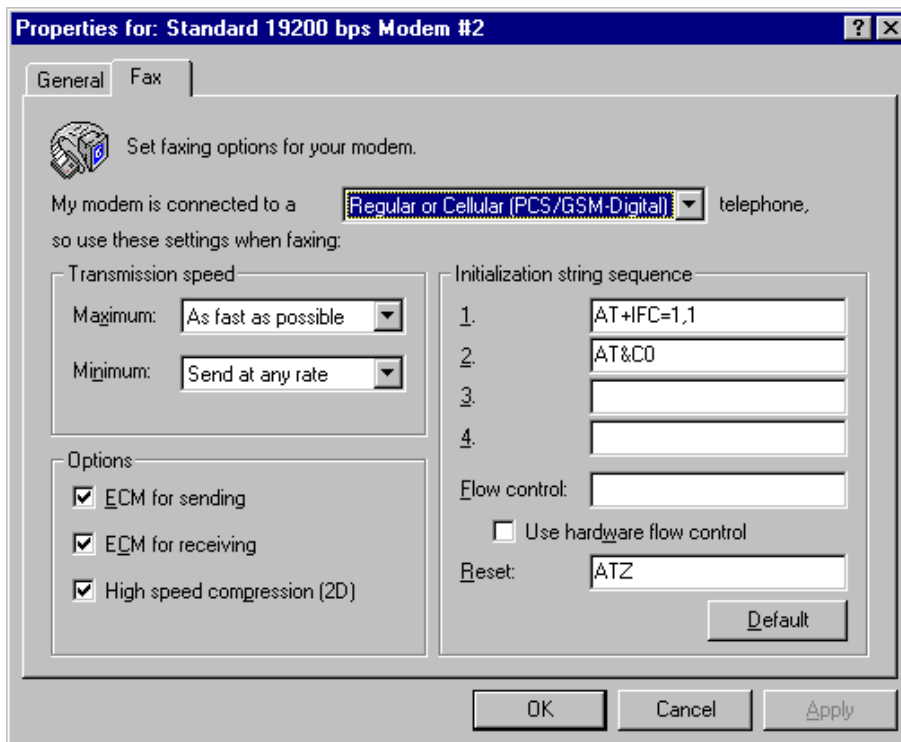With Win Fax Pro Installed, setup the modem as follows:

Under Program Setup, select Properties

Check Modem is Standard 19200, if not, go to 10.1.4. Select Properties

Check that the following setting are made:

8.4 Accessories

Description of Accessory	Maxon Part Number
5 metre Power Lead	CA8360
9 way D-type Male to Female RS-232 Interface Lead	CA8361
Dual-band GSM Antenna for in-vehicle mounting	CA8401
12V 1 Amp Mains Power Supply fitted with Euro connector	CA6823
Euro Connector to UK adapter	ME440014

9 GLOSSARY

Abbreviation	Meaning
AT	Hayes AT modem serial command set commonly used for land line modems
CI	Command Interpreter.
DTE	Data Terminal Equipment
DTR	Data Terminal Ready
GPS	Global Positioning System
GSM	Global System Mobile
I/O	Input / Output
LED	Light Emitting Diode
SIM	Subscriber Identity Module
SMS	Short Message Service
SMSC	Short Message Service Centre